

PATENT

Atty. Dkt. No. SAR 13695A

REMARKS

This is intended as a full and complete response to the Office Action dated April 1, 2005, having a shortened statutory period for response set to expire on July 1, 2005. A one-month extension request is being filed herewith. Claims 1 -13 remain pending in the present application. Claims 1-13 are rejected and claim 13 is objected to. Claims 1-4, 6, 7, 9-11 and 13 have been amended. Please reconsider the claims pending in the application for the reasons discussed below.

I. Objection of Claim 13

The Examiner has objected to claim 13 because "[t]here is insufficient antecedent basis for this [tuners] limitation in the claim." Applicants have amended claim 13 by removing the term "tuners." Therefore, this objection is now considered moot. Accordingly, withdrawal of this objection is respectfully requested.

II. Rejection of Claims 1, 3-5, 7-9 and 11-13 for Double Patenting**Claims 1 and 3**

The Examiner has provisionally rejected claims 1 and 3 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 7 of co-pending Application Serial No. 09/776,078 in view of Win et al. (U.S. Patent No. 6,804,312, hereinafter "Win").

In response, Applicants provisionally agree to file a terminal disclaimer to resolve the present double patenting rejection if and when the co-pending application is finally allowed. In accordance with MPEP §804(I)(B), "if the 'provisional' double patenting rejection in one application is the only rejection remaining in that application, the examiner should then withdraw that rejection and permit the application to issue as a patent, thereby converting the 'provisional' double patenting rejection in the other application(s) into a double patenting rejection at the time one application issues as a patent." As such, Applicants will file a terminal disclaimer in the future, if necessary.

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Claims 4, 5, 7-9 and 11-13

The Examiner has provisionally rejected claims 4, 5, 7-9 and 11-13 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 3 [sic, 7] of co-pending Application Serial No. 09/776,078 in view of Win.

In response, Applicants provisionally agree to file a terminal disclaimer to resolve the present double patenting rejection if and when the co-pending application is finally allowed. In accordance with MPEP §804(I)(B), "if the 'provisional' double patenting rejection in one application is the only rejection remaining in that application, the examiner should then withdraw that rejection and permit the application to issue as a patent, thereby converting the 'provisional' double patenting rejection in the other application(s) into a double patenting rejection at the time one application issues as a patent." As such, Applicants will file a terminal disclaimer in the future, if necessary.

III. Rejection of Claims 1, 2, 4-6, 8-10, 12 and 13 Under 35 USC §103(a)

The Examiner has rejected claims 1, 2, 4-6, 8-10, 12 and 13 under 35 USC 103(a) as being unpatentable over Tsujimoto (U.S. Patent No. 5,524,125, hereinafter "Tsujimoto") in view of Win. In response, Applicants have amended independent claims 1, 4 and 9 in order to more clearly recite aspects of the claimed invention.

Independent claims 1, 4 and 9, as amended, recite limitations not taught or suggested by any combination of the cited references. As discussed below, Tsujimoto fails to teach or suggest spatially equalizing and temporally equalizing spatially diverse replicas to generate an equalized RF signal as recited in the aforementioned claims. Win fails to bridge the gap left by Tsujimoto.

Specifically, Tsujimoto discloses an interference cancellation apparatus that can be operable at a high convergence speed on fading diversity channels. (See Tsujimoto Abstract.) Win discloses techniques to determine an antenna selection and associated weights for a transmission system having multiple antennas. (See Win Abstract.)

The Examiner's attention is directed to the fact that Tsujimoto fails to disclose or suggest adaptively combining the plurality of spatially diverse replicas to generate an

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equalized RF signal as positively claimed in amended independent claims 1, 4 and 9.

Specifically, Applicants' independent claims 1, 4 and 9 recite (emphasis added):

1. A computer readable storage medium containing a program that, when executed upon a computer system, causes the a receiver to perform a method of receiving a radio frequency (RF) signal comprising:
 - receiving a plurality of spatially diverse replicas of the RF signal;
 - and
 - adaptively combining the plurality of spatially diverse replicas to generate an equalized RF signal,wherein the combining step comprises:
 - spatially equalizing each of the plurality of spatially diverse replicas;
 - combining the spatially equalized replicas to generate a combined signal;
 - generating a symbol error signal from the combined signal;
 - temporally equalizing the combined signal using a decision feedback equalizer; and
 - adapting the spatial equalizing and the temporal equalizing steps to the symbol error signal.
4. An apparatus for receiving a radio frequency (RF) signal comprising:
 - a front end for receiving spatially diverse replicas of the RF signal, selecting the RF signal from a frequency band, and digitizing the selected RF signal; and
 - an integrated circuit comprising means for adaptively combining the spatially diverse replicas of the selected RF signal to generate an equalized RF signal;wherein the means for adaptively combining comprises:
 - a plurality of feed forward equalizers;
 - a combiner for combining the output signals from each of the plurality of feed forward equalizers to form a combined signal;
 - an error circuit for generating a symbol error signal;
 - a decision feedback equalizer for suppressing inter-symbol interference in the combined signal; and
 - a tap control circuit for adjusting tap weights of the plurality of feed forward equalizers and the decision feedback equalizer using the symbol error signal.
9. An apparatus for receiving a radio frequency (RF) signal comprising:
 - a front end for receiving spatially diverse replicas of the RF signal, selecting the RF signal from a frequency band, and digitizing the selected RF signal; and

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a digital signal processor (DSP) comprising means for adaptively combining the spatially diverse replicas of the RF signal to generate an equalized RF signal;

wherein the means for adaptively combining comprises:

a plurality of feed forward equalizers;

a combiner for combining the output signals from each of the plurality of feed forward equalizers to form a combined signal;

an error circuit for generating a symbol error signal;

a decision feedback equalizer for suppressing inter-symbol interference in the combined signal; and

a tap control circuit for adjusting tap weights of the plurality of feed forward equalizers and the decision feedback equalizer using the symbol error signal.

An important aspect of Applicants' claimed invention is thus, in pertinent part, receiving spatially diverse replicas of a wireless transmission, spatially equalizing the replicas, combining the now spatially equalized signals, temporally equalizing the combined signals, and then adapting the combined spatially/temporally equalized signal to the symbol error signal that had been previously generated. Tsujimoto is completely devoid of both spatially equalizing and temporally equalizing the spatially diverse replicas and then adapting such resulting signal to the symbol error signal as claimed by Applicants.

By both spatially and temporally equalizing these combined signals, co-channel interference and multi-path propagation effects can be substantially reduced. Tsujimoto merely disclosed a finite impulse response forward transversal filter. In fact, whereas the presently claimed invention recites as a first step spatially equalizing the spatially diverse replicas, which would include distortion, Tsujimoto teaches away from this novel approach. (See Tsujimoto spec., col. 7, lines 1-46, "the first and second transversal filters 101 and 102 produce[s] the first and second transversal filtered signals S_{n1} and S_{n2} which are deprived of each pre-cursor distortion thereby, respectively.").

Win discloses methods and systems for spatial processing in wireless systems. (See Win spec., col. 1.) Specifically, Win provides a method and system for selecting a subset of antennas in a receiver system as a function of the signal-to-interference-plus-noise (SINR) ratio. (See id.) However, Win fails to bridge the significant gap left by Tsujimoto in that Win neither teaches or suggests a method or apparatus for both

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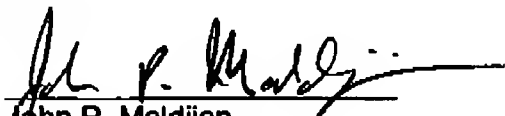
spatially and temporally equalizing spatially diverse replicas and then adapting such resulting signal to the symbol error signal as claimed by Applicants.

Thus, because Tsujimoto fails to disclose or suggest a method or apparatus for reducing multi-path distortion as recited by Applicants' independent claims 1, 4 and 9, it does not (either alone or in any permissible combination with Win) disclose or suggest each and every element as claimed in Applicants' claims 1, 4 or 9. As such, the Examiner has not presented a prima facie case of obviousness in combining Tsujimoto with Win (or any other secondary reference) to arrive at the claimed invention of Applicants' independent claims 1, 4 and 9. Accordingly, withdrawal of the rejection is respectfully requested.

Furthermore, claims 2-3, 5-8 and 10-13 depend from independent claims 1, 4 and 9, either directly or indirectly, respectively, and recite additional features therefor. Because, as discuss above, the Tsujimoto reference (either alone or in any permissible combination with Win) does not teach, suggest or otherwise render obvious Applicants' claimed invention as recited in independent claims 1, 4 and 9, these dependent claims are also not rendered obvious and are allowable. Accordingly, withdrawal of the rejection of these dependent claims is respectfully requested.

Having addressed all issues set out in the Office Action, Applicants respectfully submit the claims are in condition for allowance and respectfully request the claims be allowed.

Respectfully submitted,


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